



UPDATE

FALL 2001



D. Rothenberg

In This Issue

Message From the
Director

CAC Corner
Page 2

Sharks in Long Island
Sound
Page 3

Seaweeds Thrive in the
Sound
Page 3

Mussels Beaching in
Long Island Sound
Page 4

Long-Legged Water Birds
of the Sound
Page 5

Shore Crab Invasion
Page 7

Program News
Page 8

Places to Visit
Page 8

MESSAGE FROM THE DIRECTOR

Our theme for this newsletter is the plants and animals of Long Island Sound, not as resources to be fished or harvested, but as components of the ecosystem, inhabitants interesting in their own right. Some of the plants and animals of the Sound are year-round inhabitants, others are regular, seasonal visitors. Some, like the Japanese shore crab now dominating rocky intertidal areas, are recent arrivals to Long Island Sound, out-competing native species to the point of being labeled “invasive”. Their life histories sometimes intersect with ours, as when masses of blue mussels washed up on the beaches of Stratford Point, CT this summer. However, most likely they would go unnoticed unless deliberately brought to our attention.

Fortunately, many educators are bringing marine life to our attention by expanding the study of Long Island Sound and its inhabitants and using the Sound as a living laboratory to teach students about biology and ecology. The value of this shouldn't be underestimated. Science isn't the dry resuscitation of facts - an approach that turns off many middle and high school students. Science is about tapping into our natural curiosity in a disciplined way to understand the world around us.

Long Island Sound provides an ideal curriculum for educators in schools, aquaria, nature centers, and environmental organizations to capitalize on the sense of wonder still intact and spontaneous in kids. There are two benefits from this. First, people see their backyard, their region, their Long Island Sound as a place of interest and excitement. The wonders of nature aren't limited to far-away places seen only on television from the comfort of living rooms. Experiencing nature up close and personal instills a sense of appreciation, understanding, and stewardship. That's important for the long-term protection of the Sound and the creatures that inhabit it. Second, hands-on learning through observation, inquiry, and discovery rather than by rote energizes the study of science. That's important for the education and creativity of the region's students.

The bottom line is that Long Island Sound, in addition to being a great place to recreate, is a fascinating place for education. I hope this issue of **UPDATE** informs you about some of the plants and animals of the Sound, and that you'll take advantage of some of the places and opportunities around the Sound to learn more.

Mark Tedesco

C O R N E R

CAC by David Miller

The Citizen Advisory Committee (CAC) is embarking on a strategic planning process for its future. The CAC was formed shortly after EPA's Estuary Program for Long Island Sound began in 1986. The CAC has diverse representation of many stakeholders from Connecticut and New York. These stakeholders include environmentalists, conservationists, academic leaders, community representatives, educators, business representatives, and more. As a member since 1989, I am honored to testify that this group of Long Island Sound interests has had a proud history. In order to continue that tradition, we agreed that planning for the future and setting goals were critically important for the CAC and the Sound.

Over the past decade, the CAC has been in the forefront in the creation of the EPA Long Island Sound Office in 1991, the Long Island Sound Comprehensive Conservation and Management Plan, the signing of two Long Island Sound Agreements between the Governors of Connecticut and New York with USEPA, as well as the development of the 2001 Long Island Sound Agreement to be signed in the near future. The CAC has sponsored numerous public outreach and educational programs with governmental and private institutions. Complex issues, such as pollution loading and sediment contamination, have been tackled by the CAC. New committees and attention on Living Marine Resources have been

generated as a direct result of CAC activities. The CAC's role has not only been to advise on policy, but also to increase public understanding and involvement around the Sound.

In addition, the CAC has embarked on new initiatives and priorities, including the need for public access to the Sound as well as the need to protect critical habitat for birds, wildlife, and marine organisms. These issues have been supported by the CAC and subsequently, incorporated into governmental plans for the Sound. The CAC has also been a leader in promoting state and federal dollars for Long Island Sound cleanup and was a leader in the passage of the Long Island Sound Restoration Act in Congress. The Long Island Sound Restoration Act authorizes \$40 million a year for Long Island Sound cleanup, and each year CAC members urge Congress to fully appropriate funds.

There are many more examples to cite, but the most important role of the CAC is that it connects the people of the Sound to the programs designed to enhance this great body of water. As the CAC reviews its goals and objectives and works to help implement the new Long Island Sound Agreement that has been developed for the Governors and EPA, it will never lose sight of its critical role in getting the public involved in the restoration and future stewardship of the Sound.

I want to thank all that serve and have served in the past on the Long Island Sound Citizen Advisory Committee for your support and guidance. Citizen involvement is the fuel that drives government programs. The needs of Long Island Sound will continue to be met as long as we have

a strong CAC, dedicated state and federal agencies, and a strong scientific base. The Long Island Sound Program is one of the best estuary programs in the country, and it is the people involved that have made the difference.

Thank you again for making a difference for conservation and the future of Long Island Sound.

David J. Miller New York Co-Chair of Citizen Advisory Committee and Executive Director of Audubon New York

Save the Date

The next CAC meeting is scheduled for March 14, 2002 in New York, location to be determined. Call the EPA Long Island Sound Office at (203)977-1541 or check the LISS web site www.epa.gov/region01/eco/lis/calendar.htm for the schedule of 2002 CAC meetings.

Continued from page 7.

tides. How have these non-native crabs caused these changes? Several recent studies in Long Island Sound showed that the non-native crab is an efficient predator on a variety of prey. Populations of green crabs, blue mussels, and periwinkle snails have all declined at the same time that numbers of *H. sanguineus* have increased. Even though the Asian shore crabs are generally much smaller than adult green crabs, the non-natives quickly consume the juveniles. As a result, overall numbers of green crabs have decreased greatly. This has had an important economic impact; green crabs were once the base for a Long Island Sound industry that sold the crabs for use as bait by fishermen.

George Kraemer is an Associate Professor of Environmental Sciences at Purchase College.

Sharks in Long Island Sound

by Dave Sigworth

Yes, swimmers, there are sharks in Long Island Sound.

Growing to lengths of up to 10 feet, sand tiger sharks are among the largest and most common species of sharks found in Long Island Sound. They can occur in the western Atlantic from Maine to Brazil, and also are common off South Africa and Australia, where they are called gray nurse sharks.

According to the International Shark Attack Files based at the University of Florida, sand tiger sharks (*Odontaspis taurus*) rank No. 4 on the list of unprovoked attacks worldwide over the last 420

years. However, the most recent authenticated sand tiger attack in Long Island Sound occurred 40 years ago, in 1961. (And, if it's any reassurance, that one was a non-fatal incident.) "Talk to any Sound fisherman, and he'll tell you that more people are bitten by bluefish than by sand tiger sharks," said Jack Schneider, animal curator and director of education at The Maritime Aquarium in Norwalk. Shark attacks should be kept in perspective. Most people have a slim chance of even encountering a shark, much less being bitten.

How do you identify a sand tiger shark? First, look at the dorsal fins on the shark's back. The two dorsal fins on a sand tiger are close in size, while on most sharks, the foremost dorsal fin, near the head is larger. Also, the narrow teeth of a sand tiger shark are visible all the time, not just when it bites. In many

other species, such as reef and blue sharks, the teeth are somewhat out of view until the shark extends its jaws to bite.

Because of their imposing teeth-bared appearance, and because they survive well in captivity, sand tiger sharks are often displayed in aquariums, including The Maritime Aquarium's 110,000-gallon Open Ocean tank.



Sand Tiger Shark

Sand tiger sharks are born as live pups, only one or two to a litter. During their year of incubation, the mother continues to produce eggs, which the unborn pups eat! At birth, the pups measure about 30 inches long. Juvenile sand tiger sharks have spots that eventually fade as they mature. Frequently described as sluggish, sand tigers feed on many species of smaller fish, as well as crabs and squid.

Other common species of sharks in Long Island Sound include the smooth dogfish (up to 5 feet long) and spiny dogfish (up to 4 feet). Brown, blue, mako, thresher, and even hammerheads are occasional visitors, especially near the Race, the narrow entry channel at the Sound's eastern end.

Dave Sigworth is the Projects Editor for The Maritime Aquarium, Norwalk, CT.

Seaweeds Thrive in the Sound

by Peg VanPatten

Because of its abundant nutrients, temperature range, and its sheltered geographic location, Long Island Sound supports a rich algal flora, better known to most as seaweed. In fact, there are more than 200 species of seaweed, or macroalgae, in the Sound. Like the terrestrial plants more familiar to many people, not all of them are present at the same time. There are some, however, that are present year-round or nearly so, such as kelp, rockweed, oarweed, and Irish moss. Biologists put the seaweeds into three divisions according to their dominant pigments – Chlorophyta, Phaeophyta, and Rhodophyta– or simply, green, brown, and red respectively. These pigments absorb various frequencies of light, and the limited light available in coastal waters determines the depth at which the algae can be found. In general, greens are closest to shore, browns in the intertidal zone and subtidal zone, and reds further down and farthest from shore. Seaweed, which often attaches to rocks or other hard surfaces during some part of its life, provides habitat, food, and shelter for a number of aquatic organisms, and thus is very important to the ecology of Long Island Sound. The diversity in form and beauty of these algae is astonishing, and so is the variety of utilitarian uses humans have found for them.

Colloidal extracts from various seaweeds are used in commercial food production as thickening or stabilizing agents. Carrageenan, for example, found in Irish moss (*Chondrus crispus*), makes ice cream, toothpaste, and many other products smooth and

continued on page 6.

Mussel Beaching in Long Island Sound

by Inke Sunila

During past summers beachcombers witnessed an eerie sight - millions and millions of blue mussels (*Mytilus edulis*) washed up on the shores of Long Island Sound. Mussels formed piles one foot high in endless rows along the beach, left behind by the ebb tide. These formations were accompanied by the odor of decay and the constant screech of feasting shorebirds.

While odd, the phenomenon of mussel beaching is the usual destiny of intertidal mussels in their southern range during hot summer days. Blue mussels are a northern species. Mussel aquaculture flourishes in areas north of the Sound, e.g., in Maine and Prince Edward Island, Canada. Areas south of the Sound, Delaware Bay and North Carolina, have been the scenes of frequent beachings for years, and now, during unusually warm summers, so is Long Island Sound.

A mussel is usually characterized as a sessile animal, one that does not move under its own power. It uses its special set of anchor lines, the byssus, to fasten to a hard surface for life. However, mussels are able to detach their byssi and move to another location with ease. Adult mussels, unlike oysters, their close relatives, have a functional foot throughout their life. The foot aids in byssus formation and locomotion. During a sudden change in water quality, such as salinity, heavy metal exposure or, temperature, mussels jettison their byssus by a movement of their foot and sink. This physical ability to escape danger provides mussels with an adaptation mechanism, that has enabled them to become prominent species on most sea floors in the northern hemisphere.

Once free from the byssal attachment, the mussel seeks a new location with the aid of the foot. There it attaches itself by building a new byssus in less than 20 minutes. This is accomplished by gently tapping the surface with the foot, which has a special structure, the byssal groove, leading to the byssus gland. Byssus thread material, nature's super glue, is excreted in liquid form along the byssus groove, where it hardens instantly when in contact with sea water.

The same mechanism that allows mussels to tolerate environmental changes is also a weakness that sets limits for their geographic distribution. When immersed, mussels receive oxygen from the seawater through their gills. During emersion in intertidal areas,

mussels utilize their well-developed anaerobic metabolic pathways. They also frequently gape slightly in order to let some oxygen from the air diffuse through the mantle cavity fluid. Now, let's imagine a hot summer day, and millions and millions of mussels fastened to the pilings and rocks of the Sound during low tide. Mussels are gaping slightly for aerial oxygen intake. They jettison their byssi and "clam-up" in response to temperature stress. Instead of sinking to the protective depths of the sea, they are set adrift, floating due to a gas bubble inside their shell. They start their long journey, floating on the waves maybe for miles, drifting with the tides and the currents, until they are tossed to the shore.

During summer beaching most mussels occur as individual specimens without the byssi. Some may retain their byssi, if they were originally fastened to the shell of a fellow mussel, that jettisoned. Winter beachings are also common. The forces of nor'easters detach mussels as large clumps and toss them on the shore. During winter beachings, mussels occur as groups with intact byssi.

Are mussel beachings a serious environmental concern that



Stratford Point Connecticut

might lead to the decline of this species in the Sound? In the short run, no. As any species close to the limit of its distribution, mussels are subject to major variations in population size. Beachings affect only intertidal mussels, while the major portion of the local mussel population continue their secluded life in the depths of the Sound, protected from temperature changes by the thermocline. However, frequent observations of a phenomenon previously considered characteristic of areas south of the Sound is an indication of unusually high summer temperatures, a trend connected to global warming.

Inke Sunila is a shellfish pathologist for the State of Connecticut, Department of Agriculture, Bureau of Aquaculture.

Long-Legged Water Birds of the Sound

by Andrew MacLachlan

Hérons, egrets, and other long-legged wading birds - we expect them to be part of our landscape, yet they are always special enough to turn our heads. Perhaps because these birds dominated by legs, neck, and beak are a visual surprise, more like a 100 million year old pterodactyl than an element of modern Long Island Sound.

During the summer months about nine different species of long-legged colonial water birds that share several common physical features and behaviors can be seen in the region. In the winter, only the great blue heron and the black-crowned night-heron are regular inhabitants of this area. All these water birds are medium to large birds with tail to bill measurements ranging from 20" to 45", with robust spear-like bills that help distinguish them from the generally smaller shorebirds such as sandpipers. The list of Long Island Sound species includes some of the following:

- Great blue herons, the largest of this group, stand nearly four feet high, with wings that expand to six feet, yet weigh only about 5 lbs;
- Snowy egrets, all-white birds with black bill and legs but distinctive yellow feet that they use to stir up shallow water and attract fish and other prey while feeding;
- Black-crowned night-herons, which lack the long neck characteristic of this group and feed at night, unlike many of the other egrets and herons and;
- Glossy ibis have five-inch-long down-curved bills and glossy green-brown plumage. Ibis gregariously feed in groups using the ends of their bills to feel for insects and worms in the water and mud.

Most species of long-legged water birds feed in 1-20 inches of fresh or salt water. They eat a wide diversity of prey including molluscs, insects, and amphibians, but fish dominate their diet. To capture fish, the birds stalk on foot or wing, lure and stir with feet, or remain motionless, sometimes with wings outstretched to block sunlight. Despite their spear-like bills, the birds generally grasp their food rather than puncture it.

While we can regularly see these species of birds feeding in salt marshes and wetlands, this is only a portion of the habitat necessary for their summer life in the Northeast. Most of these birds nest in colonies located on upland islands and peninsulas, forming mixed communities of dozens to hundreds of individuals. These nesting sites can be ten or more miles from the necessary feeding areas. Colonial birds generally form platform nests made of loosely woven sticks, four to twenty feet high in the shrubs and trees, often within six feet of each other. By choosing these isolated colony sites, the birds reduce the threats from mammals, including predation from raccoons and domestic cats, or abandonment caused from human induced noise or habitat damage.

Examining some numbers of long-legged wading birds and people in the coastal counties of Connecticut and Long Island, including New York City, can provide some perspective on the relationship between humans and the habitats available for wildlife.

- Adult herons and egrets number about 8,000.
- Humans in the same area number 14,500,000.

That means for every 14,500 people there are 8 herons or egrets trying to find space to make a living. If we consider the habitat required for a nesting pair of egrets vs. a "nesting pair" of humans, with our homes, roads, markets, and recreation sites, it is easy to see how people could easily overwhelm the feeding or nesting needs of these birds. We need to remember we can easily damage or eliminate many attractive, entertaining, and health-related values of our environment.

The Long Island Sound Study provides some direction and goals for the many government agencies and non-profit organizations concerned with management and conservation of living resources and their habitats. Water birds are some of these living resources that we cannot simply expect to be part of our landscape. We must attend to the details and choices needed for conservation to succeed.

Andrew MacLachlan is a biologist with the US Fish and Wildlife Service, Coastal Program office in Rhode Island.



Nest and eggs of a Black-Crowned Night-Heron

Snowy Egret displaying breeding plumes



Photo by Mark Wilson WILDSHOT

Seaweeds continued from page 3.

creamy. Another marine colloid, alginate, comes from portions of kelp (*Laminaria* spp.) and rockweed (*Fucus* spp.). Alginate is used in syrups and fillings as well as coatings for paper, film, medications, and fabric. Yet another colloid, agar, is used in fruit and cheese fillings as well as a medium in laboratories for culturing organisms, gel for DNA fingerprinting, and as a clarifying agent for wine and beer.

Seaweeds can also be sea vegetables, and are a wonderful source of vitamins, protein, and trace nutrients. Kelp, the ruffly, long, brown alga that children love to drape themselves in at the beach, is the star of the show; the largest seaweed of the Sound. It is collected and dried, then used as soup stock or sea vegetable by many peoples of the world, and used as a traditional combination fertilizer and bug repellent in many a New England garden. While the giant kelp of the West Coast gets more commercial use and popular acclaim, research by the University of Connecticut's Dr. Charles Yarish has shown that our own LIS kelp, *Laminaria* spp. can grow as much as an inch and a half per day! It has been known to reach as much as 30 feet long. Kelp is abundant wherever rocky bottoms occur in the Sound.

Another seaweed valued commercially is a red alga called nori, or *Porphyra* spp. Most people have experienced nori in the form of sushi wrappers, but few are aware that nori, in fact several species of nori, occur wild in Long Island Sound. Nori is called a miracle food, because it has more vitamin C per unit than orange juice, more calcium than milk, and more protein than soybeans. Efforts to farm algae as aquaculture

industries are burgeoning. The market for nori, according to Dr. Yarish, is \$1.6 billion per year.

One use of seaweed that has real potential for Long Island Sound and other valuable but threatened estuaries worldwide, is the use of seaweed to cleanse eutrophic waters. The seaweed acts as a nutrient scrubber, taking up nitrogen and phosphorus, the very nutrients used in gardens for fertilizer, and converting it into healthy seaweed product that can be used for food or medicinal purposes. These same nutrients enter the water from wastewater treatment, runoff from lawns and gardens, and waste from fish. When found in excess, they become pollutants and can cause or exacerbate blooms of small algae leading to the hypoxic situation that we are familiar with.

Until recently, nori and many other local seaweeds have been largely unnoticed in this part of the world, but those that were harvested were gathered from nature. In contrast, many countries have been working hard at actively farming seaweeds for centuries, while domesticating and improving their own local species for crops. Aquaculture, or farming aquatic species, is growing in popularity, and is the way to provide uniform product in adequate supply.

Dr. Yarish has been collaborating with Dr. Raquel Carmona from Spain, Dr. George Kraemer at SUNY Purchase, Chris Neefus at the University of New Hampshire, Dr. Thierry Chopin in New Brunswick, Canada, and a host of other scientists and industry

partners in the U.S., Chile, Mexico, China, Korea, and Japan to share aquaculture techniques and to demonstrate the efficiency of nori for bioremediation, or nutrient scrubbing. Yarish and Dr. Thomas Chen at the UCONN Biotechnology Center have also been hard at work studying the genetics of various algae and creating the first transgenic nori, combining genes from other strains or species to produce specimens that combine the most desirable characteristics of all.

Recently, Yarish and colleagues deployed the first domesticated New England nori in Long Island Sound. Eight nets "seeded" with young algae are in the water near Bridgeport, Connecticut, forming a nori nursery. As Yarish says, "Now we have to pray to the seaweed gods for good weather, warm temperatures, lots of light, control of diatoms, etc!"



Vats of Nori

Peg Van Patten is the Communications Director for Connecticut Sea Grant at the University of Connecticut.



Shore Crab Invasion

by George

Kraemer

Humans have a long history moving, both intentionally and accidentally, all types of organisms into territories outside their natural ranges. About 5-10% of the non-native species establish themselves, and about 10% of those produce detrimental ecological effects.

While non-natives have the potential to enrich the communities into which they are introduced, more often they cause marked declines in biodiversity. Some introduced species (also referred to as non-native, exotic, and invasive species) grow and mature rapidly, produce many offspring that disperse widely, tolerate a variety of environmental conditions, and rely on many different sources of food.

Non-natives may alter nutrient availability or influence food web structure and energy flow patterns. The latter can occur via competition and predation, and influence survival, growth, and reproductive output. The Long Island Sound may be particularly susceptible to invasion; the conventional wisdom holds that high local diversity provides resistance to invasion, and estuaries such as the Sound are notable for their low diversity.

The economic effects of introduced species as a group are often decidedly negative; a recent estimate of the annual costs for control of non-natives and remediation topped \$120 billion. A well-known non-native species with a detrimental economic impact is the zebra mussel (*Dreissena polymorpha*). In May 1997, a Michigan paper company had to remove 400 cubic yards of zebra mussels from its intake pipes at a cost of \$1.4 million. This remediation effort will likely be repeated as the mussels again

settle onto the intake pipes.

The Asian shore crab, *Hemigrapsus sanguineus*, was first found in the U.S. in 1988 in southern New Jersey. This crab has a wide home range, from southern Japan to the northern Russian coast (20°-50°N latitude), indicating broad temperature tolerances. Not surprisingly, *H. sanguineus* has spread on our coast north into Maine and south to North Carolina. Within this range, it is found on beaches having a rock-cobble-boulder substrate. Overturning a rock at low tide during summer reveals dense aggregations of these fast-moving, aggressive crabs (Make sure you return the rock to its original position and orientation!).

H. sanguineus arrived in the Long Island Sound in 1994 or 1995. The Asian shore crab has since become the dominant crab in the intertidal zone in the western Long Island Sound. Densities greater than 300 Asian shore crabs per square meter have been measured at a Rye, NY study site. Native crabs *Eurypanopeus depressus* (Common Mud crab), *Carcinus maenas* (Green crab), and *Cancer irroratus* (Atlantic Rock crab) were once also present in significant numbers at this site. *C. irroratus* has not been found since 1998, *C. maenas* densities have decreased 50% from 1998 to 2001, and *E. depressus* densities are down 96%. Overall, the diversity of the intertidal crab community at the western Long Island Sound site has dropped greatly since 1998.

The Asian shore crab has caused serious changes in the community of plants and animals in the intertidal zone, the area covered and uncovered by the rise and fall of the

Continued on page 2.

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If you would like to be placed on the mailing list or make changes to your address please contact the NY LIS Office.

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US EPA
www.epa.gov



CT DEP



NYS DEC
www.dec.state.ny.us
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M N E W S

LIS Agreement

TRA
G
O
P
The September 11 attack on the World Trade Center tragically put on hold plans to reconvene the Governors of Connecticut and New York and the EPA Administrator to celebrate progress and reaffirm commitments to the Long Island Sound restoration by signing a Long Island Sound 2001 Agreement. Intended to update the 1996 agreement on the Comprehensive Conservation Management Plan (CCMP) implementation by setting targets and time frames for further CCMP implementation, the 2001 Agreement signing was scheduled to occur by the end of September (coinciding with National Estuaries Day). Discussions are now underway to reschedule the event.

12 Grants Awarded

The Long Island Sound Study has announced the award of 12 grants for the Public Participation Information and Education Small Grants Program. The funded projects focus on teacher training, interpretive models, aquaculture, habitat restoration, community outreach and education, controlling floatables, and the return of the Shad Festival. For more information on the funded projects or to get on the mailing list for the next call, contact Kimberly Zimmer (631) 632-9216.

For LIS Lobster Updates Visit
www.seagrantsunysb.edu/LILobsters

New Westchester County Park

Westchester County Executive Andy Spano and New Rochelle Mayor Timothy C. Idoni announced on October 24 that the county will purchase Davids Island from the city to preserve it as parkland. The county will pay the city \$6.5 million for the 78-acre, uninhabited property, a former Army post known as Fort Slocum. Located about one-half mile east of the New Rochelle mainland, the island has been a target for development due to its unique location. Under the terms of the deal, the county will hire a consultant to make specific recommendations about what kind of park should be constructed.

Places to Visit Where You Can Learn More About The Flora and Fauna of Long Island Sound

Alley Pond Environmental Center
www.alleypond.com
Atlantis Marine World
www.atlantismarineworld.com
Maritime Aquarium
www.maritimeaquarium.org
Milford Point Coastal Center
www.ctaudubon.org
Mystic Aquarium
www.mysticaquarium.org
Save the Sound
www.savethesound.org
SoundWaters
www.soundwaters.org
Sweetbriar Nature Center
www.journey.sunysb.edu/longis/sweetbri
Theodore Roosevelt Sancturay
www.audubon.org/affiliate/ny/trs
The Waterfront Center
www.thewaterfrontcenter.org
National Aquatic Nuisance Species Clearinghouse
www.aquaticinvaders.org

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